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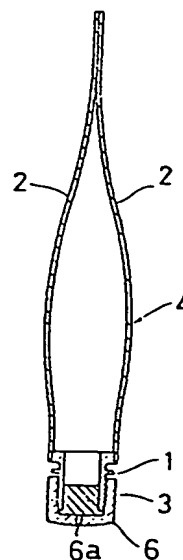
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54 Liquid preserving vessel for use in liquid sample analyzers.

57 A vessel for preserving liquids for use in analyzers for liquid samples is formed of a closed bag member (4) consisting of membrane members (2), of which a mouth portion (1) is tightly sealed with a rubber plug (3). The membranes have a remarkably small permeability to air and water vapour and great flexibility. Via an automatic device the penetration of air, water vapour and the like into the vessel from outside can be controlled when the volume of the liquid is reduced that is to say, when the calibrating solution contained in the vessel is consumed.

Fig. 3



LIQUID PRESERVING VESSEL FOR USE IN LIQUID SAMPLE ANALYZERS

- The present invention relates to a vessel for preserving liquids used for keeping standard solutions hermetically sealed against environmental influences and used for calibrating a calcium electrode and a pH electrode of liquid sample analyzers such as a blood analyzer.
- 10 In a vessel for preserving liquids of this type as marked with a in Fig. 1, a mouth portion thereof is directly connected with an analyzer b so as to feed said analyzer b with the appointed quantity of a calibrating solution contained therein at a time when said analyzer b is
- 15 calibrated. However, the conventional vessels for preserving liquids have the disadvantage that they are generally inflexible polyethylene tanks or glass bottles, and therefore, an internal air layer is expanded with the consumption of the liquid, whereby the chemical composition
- 20 of the calibrating solution is changed due to the absorption of CO_2 contained in the air and also the concentration varies due to evaporation.
- That is to say, in general, the calibrating solutions
- 25 containing buffering agents such as BES (N,N-bis(2-hydroxymethyl)-2-aminoethane sulfonic acid) ($\text{pK} = 6.9$ at 37°C) and TES (N-tris(hydroxymethyl)methyl-2-aminoethane sulfonic acid) ($\text{pK} = 7.22$ at 37°C) having a pK value near the desired calibrating pH are used in such analyzers for de-
- 30 termining calcium ions and pH at the same time, but, these buffering agents show a great affinity to calcium ions, whereby the difference is apt to be produced between the concentration of calcium weighted when the calibrating solution is prepared and the concentration of calcium ions in the prepared calibrating solution so that its prepara-
- 35 tion is difficult. In addition, in cases where such calibrating solutions are put in the above described conven-

tional polyethylene tanks and glass bottles, as above described, an air layer is expanding with the consumption of calibrating solution and the calcium ions are bonded to CO₂ contained in the air to form a sediment of calcium carbonate or evaporation takes place, and as a result, the calibrating solution is changed in composition and concentration, such that the correct calibration can not be achieved.

Thus, it is an object of the present invention to provide a vessel for preserving liquids for use in an analyzer of liquid samples which can control the intrusion of air thereinto from the outside as far as possible when the volume of the internal liquid is reduced (that is to say, the calibrating solution contained in the vessel is consumed) and further can prevent water vapour from evaporating and intruding.

A vessel for preserving of the liquid used in liquid sample analyzers according to the invention comprises the technical features as defined in claim 1. Advantageous embodiments of the invention are the subject of dependent claims.

An example of the invention is described in the following with reference to the drawings wherein

Fig. 1 is a sketch for illustrating the problems of the prior art;

Figs. 2 to 5 illustrate the preferred embodiments of a vessel for preserving liquids for use in analyzers for liquid samples according to the present invention, in which

Fig. 2 is a partially sectioned front view showing a

vessel according to the present invention;

Fig. 3 is a sectional view taken along the line III-III of Fig. 2;

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Fig. 4 is an enlarged sectional view showing the principal members of a vessel according to the present invention; and

10 Fig. 5 is a diagram illustrating an example of the application of a vessel according to the present invention in which a part (vessel) is solidly illustrated.

15 The preferred embodiments of a vessel according to the present invention will be described below with reference to Figs. 2 to 5.

As shown in Figs. 2, 3 a vessel for preserving liquids is
20 formed of a hermetically closed bag member 4 consisting of two pieces of membrane member 2, (2) provided with a mouth member 1 made of hard plastic materials, which is sealed up tightly with a rubber plug 3, fixedly adhered to the lower end portion thereof and connected with each
25 other all over the circumference thereof. 5 designates a hanging hole provided in the upper joined portion of said two pieces of membrane members 2, (2).

A four-layer laminated membrane consisting of the outer-
30 most polyester layer a, a vacuum deposited aluminium layer b, a nylon layer c (15 microns) and a low-density polyethylene layer d (100 microns), the thickness of said layer a and said layer b reaching 12 microns in all, as shown in Fig. 4, is used as said membrane member 2. Said
35 membrane member 2 is made of materials having high flexibility and having superior sealing and cut off

properties for air, water vapour and light at the same time.

In addition, a cap 6, which is provided with a small hole 5 6a for letting pass a syringe therethrough at the center thereof, can be screwed in said mouth member 1.

The solution, which contains TRIS, that is to say tris(hydroxymethyl)aminomethane, as a buffering agent, is enclosed in a vessel for preserving liquids as a standard calibrating solution for calibrating of analyzers, in which for example calcium ions and pH are determined at the same time, so that said solution may be filled in said vessel in such a manner that residual air is not contained 15 in said solution at all. The calibrating solution, which hardly shows an affinity to calcium ions, can be prepared by using TRIS as a buffering agent instead of those cases where BES and TES are used as buffering agents.

Said vessel, in which the calibrating solution is enclosed in the above described manner, is connected with an analyzer 7 to calibrate said analyzer 7, as shown in Fig. 5. Referring to Fig. 5, 8 (8) designate pipes for introducing a liquid to be tested, 9 designating a pipe for introducing the calibrating solution, 10 designating a switch 25 valve, 11 designating a drawing pump, 12 designating a flow-through type ion electrode as a measuring member, and 13 designating a drain pipe. Said vessel for preserving liquids is fixed by inserting said hanging hole 5 over a hook 14 or the like and is connected with said pipe 9 30 for introducing the calibrating solution of said analyzer 7 by inserting a syringe 16 provided with a connecting tube 15 into said rubber plug 3 of said mouth member 1. If said switch valve 10 is switched over to the calibration 35 side under such a condition, the calibrating solution is transferred to said ion electrode 12 in a determined quan-

tity at every time by means of said drawing pump 11 to carry out the calibration. Then, said membrane members are gradually contracted with a gradual reduction of the volume of the calibrating solution contained in said vessel
5 due to the high flexibility of the membrane material, whereby air cannot penetrate into said vessel from the outside.

Furthermore, since there is no solution passing through
10 a passage 17 between said drawing pump 11 and said ion electrode 12 if the calibrating solution is completely consumed, a sensor 18 for detecting the complete consumption of said calibrating solution is provided and the exchange-alarm for the calibrating solution is given on the
15 basis of the detection result to stop said drawing pump 11 automatically. Thus, the provision of an apparatus and a scale for detecting the liquid level at the vessel side is not required, and such a disadvantage adhering to the prior art that the pump 11 is operated under the condition
20 that no liquid is flowing and air is transferred to said ion electrode 12 and it must be dried can effectively be prevented.

In short, a vessel for preserving liquids for use in analyzers for liquid samples according to the present invention is characterized in that it is formed of a closed
25 bag member 4 consisting of membrane members 2 (2), of which a mouth portion 1 is tightly sealed with a rubber plug 3, having remarkably small permeability to air and water
30 vapour and great flexibility.

Further, since the bag member 4 made of greatly flexible materials contracts with the reduction of the quantity of liquid contained in said vessel even though liquid contained in the vessel is consumed, the pressure inside the
35 vessel is not reduced so much. In addition, since the bag

member 4 is made of materials having remarkably small permeability to air and water vapour, the intrusion of air from the outside as well as the evaporation and penetration of water vapour can be satisfactorily prevented, and therefore, the composition and concentration of the liquid contained in the vessel can be held constant for a long time. Therefore, a vessel according to the present invention can be very effectively used for a highly accurate determination of liquid quantities, for calibration purposes and the like.

C L A I M S

1. A vessel for preserving liquids for use in analyzers
5 for liquid samples, c h a r a c t e r i z e d in that it
is formed of a closed bag member (4) consisting of membrane
members (2), of which a mouth portion (1) is tightly sealed
with a rubber plug (3), said membrane members (2) having
very small permeability for air and water vapour and great
10 flexibility.

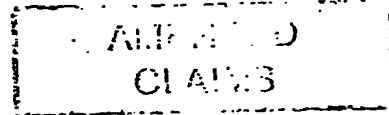
2. A vessel as set forth in Claim 1, in which said
15 membrane member (2) is formed of a four-layer laminated
membrane consisting of the outermost polyester layer (a),
a vacuum deposited aluminium layer (b), a nylon layer (c)
and a low-density polyethylene layer (d).

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C L A I M



A vessel for preserving liquids for use in analyzers for liquid samples formed of a closed bag member (4) consisting of membrane members (2), of which a mouth portion (1) is tightly sealed with a rubber plug (3), said membrane members (2) having very small permeability for air and water vapour and great flexibility,
c h a r a c t e r i z e d i n t h a t
said membrane member (2) is formed of a four-layer laminated membrane consisting of the outermost polyester layer (a), a vacuum deposited aluminum layer (b), a nylon layer (c) and a low-density polyethylene layer (d).

Fig.1

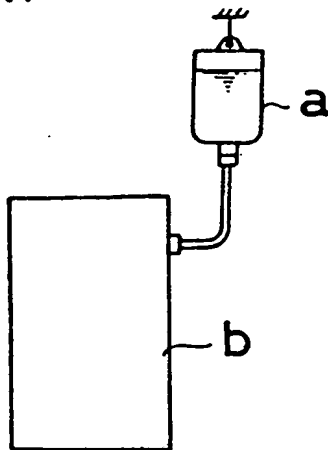


Fig.2

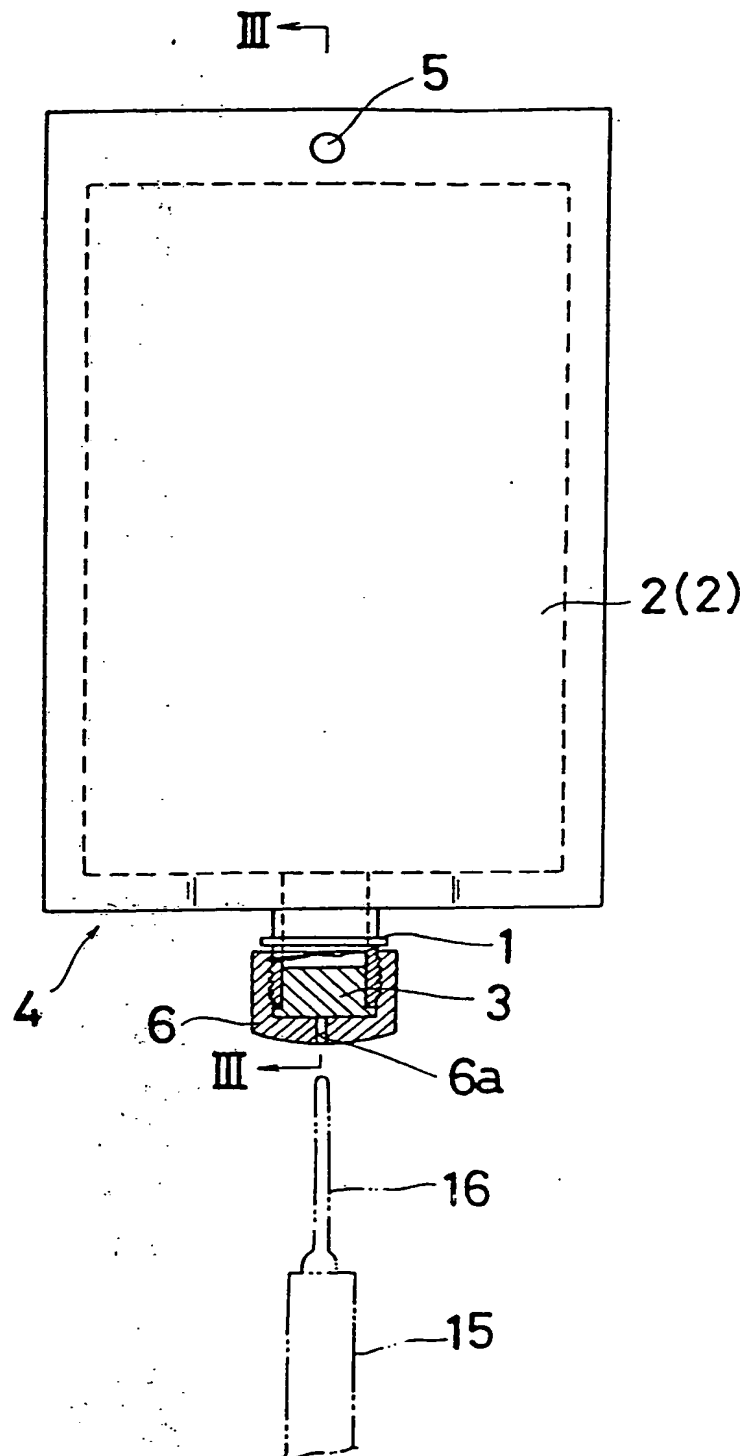


Fig. 3

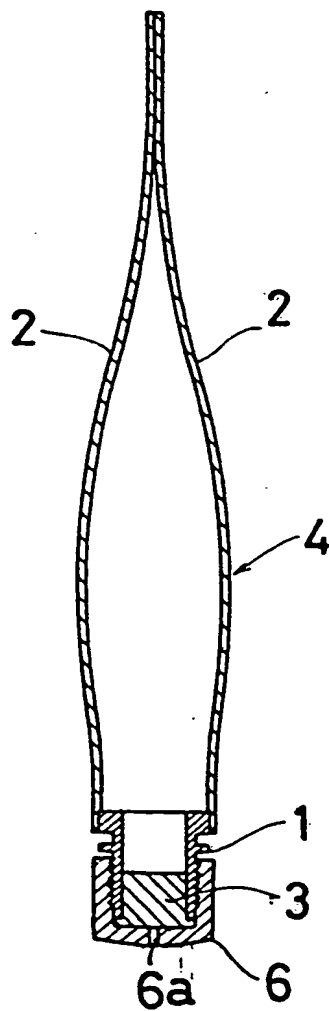


Fig.4

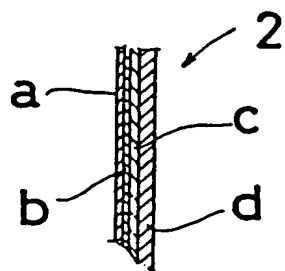
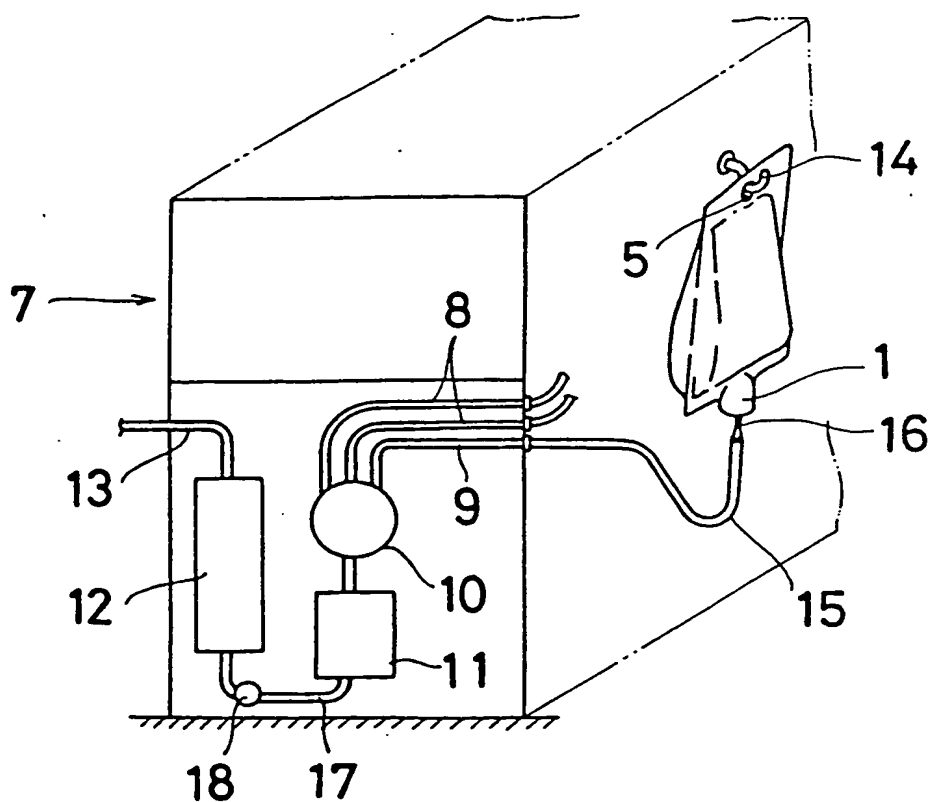


Fig. 5





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	FR-A-2 521 956 (FLUILOGIC SYSTEME OY) * Page 1, line 5 - page 2, line 29; page 6, lines 12-16 *	1	B 01 L 3/00 B 32 B 15/08
A	* Page 5, line 32 - page 6, line 12 *	2	
Y	--- US-A-4 116 336 (S.K. SORENSEN et al.) * Column 6, line 63 - column 7, line 25; figure 3 *	1,2	
Y	--- US-A-4 387 126 (J.H. REBHOLZ) * Column 2, line 12 - column 3, line 14 *	1,2	
A	--- DE-A-2 719 113 (K.H. SENGEWALD) * Pages 1-6 *	2	TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
A	--- DE-A-2 926 439 (MITSUI PETROCHEMICAL INDUSTRIES) * Page 14, lines 22-29 *	2	B 01 L 1/00 B 65 D 31/00 B 65 D 65/00 B 32 B
A	--- EP-A-0 069 642 (RHONE-POULENC FILMS) * Page 1, lines 4,5; page 5, lines 1-5,17-21 *	1,2	
--- -/-			
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28-10-1985	Examiner ANTHONY R.G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	



DOCUMENTS CONSIDERED TO BE RELEVANT			Page 2
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-3 368 560 (T.H. GEWECKE) * Column 2, lines 35-37; figures 1,2 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28-10-1985	Examiner ANTHONY R.G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			